Bear Creek Watershed

Comprehensive Surface Water Resource Report

Pepin and Buffalo Counties, Wisconsin

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Prepared by:

Heath M. Benike and Scott W. Peavy

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West Central Region
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Introduction

As part of the Lower Chippewa Basin Comprehensive Surface Water Resources Monitoring Program, the Bear Creek Watershed was sampled during the 1999 field season. The Bear Creek Watershed comprehensive stream survey was conducted to gather baseline data on fish habitat, sport and nongame fish communities, temperature regimes and macroinvertebrate communities. The purpose of this report is to summarize the condition of the surface water resources in the Bear Creek Watershed, document impairments, and recommend management goals and objectives aimed at protecting or improving it. This latest information will provide a foundation on which to base future management decisions. It can be used to address both local management and division issues such as; monitoring, stocking, trout stream classifications, fishing regulations, priority watershed projects, water regulation and zoning permits, biodiversity, outstanding and exceptional waters classification, fish habitat restoration and acquisition goals and boundaries.

Methods

Monitoring activities for this comprehensive watershed survey were initiated in June of 1999 and completed by September 1999. The following is a summary of the methods used to collect information for this survey.

Fish Surveys

Electrofishing surveys were conducted during the summer of 1999 at 45 sites on 19 streams in the watershed (Figure 1). Surveys were conducted at approximately one site per mile of permanent stream. Each site was 35 times the mean stream width (MSW) in length. Single-run electrofishing surveys were conducted at each site to inventory the sport and nongame fish communities. This inventory was also used to calculate a Coldwater Index of Biotic Integrity (Lyons, 1996) and Catch Per Unit Effort (CPUE), a measure of density or fish abundance.

On small streams, fish were collected using either one or two AbP-3 pulsed DC backpack shockers operating at approximately 1.5-2 amps. On larger streams, fish were collected using either one or two 235 Volt, 5 Amp DC generator-type stream shockers with 1 to 3 electrodes per shocker. All fish collected were identified to species and counted. All game and panfish were measured to the nearest 0.1-inch.

Habitat Assessment

Habitat assessments were conducted at each fish survey site following procedures outlined in Simonson et al. (1994). Fish habitat ratings were determined for each site according to Simonson et al. (1994) using the appropriate score sheet for the stream's width (> 10 or < 10 meters).

Macroinvertebrates

Aquatic macroinvertebrates were collected at eleven sites in the watershed during April and October of 1999. Samples were collected with a D-frame net-using methods outlined in Hilsenhoff (1982).

The samples were preserved in 70% ethanol and sent to UW-Stevens Point for sorting and identification.

Temperature

Maximum/minimum thermometers were placed in streams at most fish survey sites. The thermometers were deployed for five to six day periods during summer base flow conditions. In addition, RYAN TempMentor continuous recording thermometers were placed at seven sites in the watershed (Figure 1). The continuous recording thermometers measured and recorded stream temperatures on a 60-minute interval between June 25 and September 31, 1999.

Opening Day Angler Counts

Car counts were conducted on opening day of the 2000 fishing season between the hours of 7-10 am in an effort to document angler interest and pressure streams within the watershed. The number of vehicles were counted and assigned to the closest sampling station.

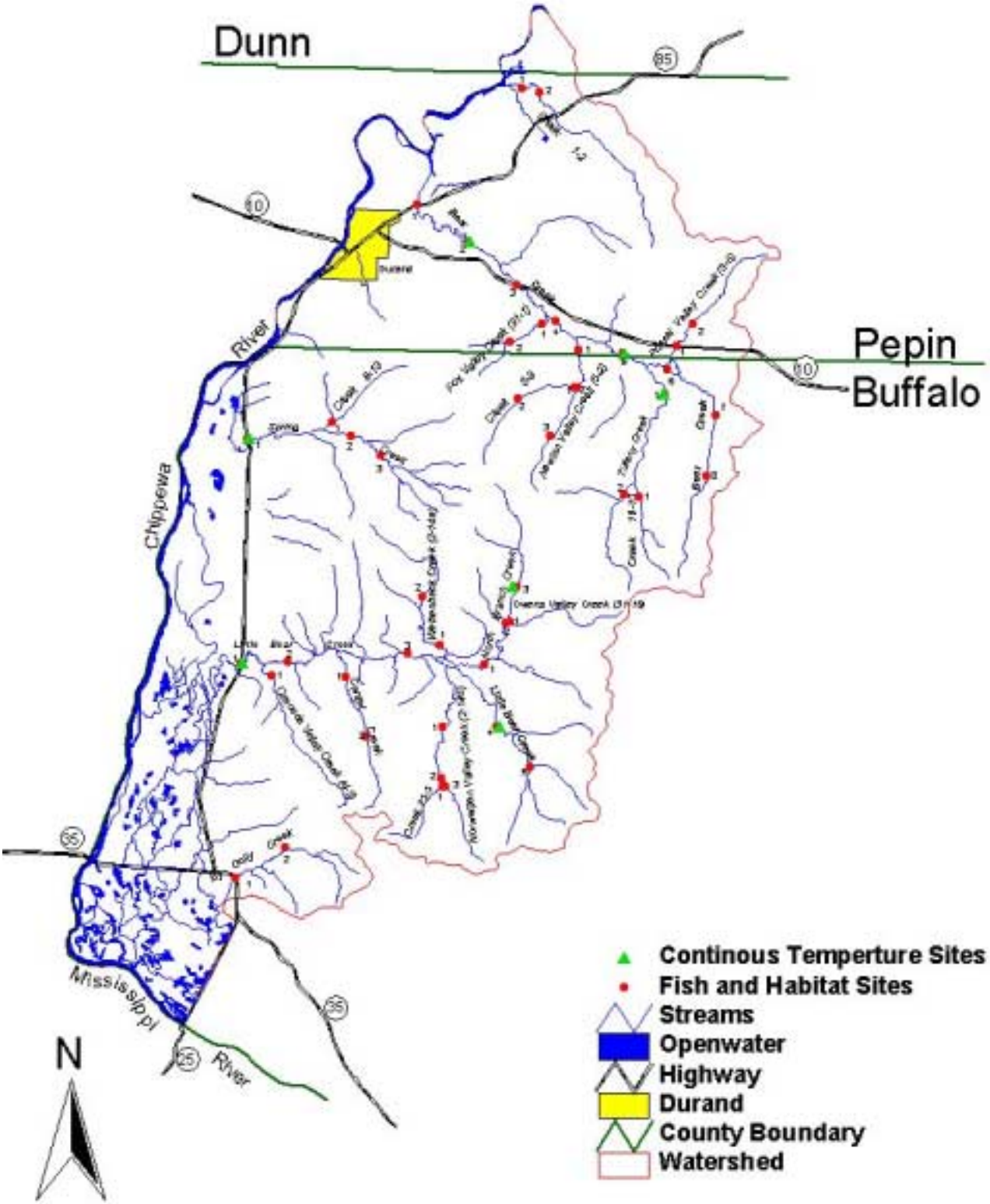
Watershed Description

The Bear Creek watershed covers 176.5 square miles in Buffalo and Pepin Counties. Bear, Little Bear and Spring Creeks are the three primary sub-watersheds within the Bear Creek watershed. The watershed drains rolling agricultural and wooded areas with many of the tributaries originating in steep coulees The watershed also drains one urban area, the city of Durand. All streams within the Bear Creek watershed drain the eastern slope of the Chippewa River Valley. Prior to this survey, the watershed contained two Class II trout streams encompassing 4.4 stream miles, and three class III trout streams encompassing 12.4 miles of stream. The majority of streams in the watershed prior to this investigation were considered marginal coldwater streams or warmwater forage fisheries.

Streams within the Bear Creek watershed have changed dramatically over the past century. Most streams during pre-settlement conditions likely contained self-sustaining native brook trout fisheries. During the early European settlement period, this region saw some logging for timber production and small dam building from milling operations. Following the logging and mill dam era, in the early and mid 1900's intensive agricultural practices and severe flooding degraded stream habitat conditions and the health of the native coldwater fish communities. Flash floods have always been a problem on streams in West Central Wisconsin due to the steep topography. Flooding conditions likely still impact stream resources but they are not considered a main limiting factor because other streams within West Central Wisconsin experience similar flood events and support very healthy coldwater fish communities.

Within the past decade many streams in the western Wisconsin have been improving. Changes in landuse practices along with the installation of BMP's in the watershed appear to be aiding in the recovery of coldwater fish communities.

Figure 1. Sampling locations in the Bear Creek Watershed



Results and Discussion

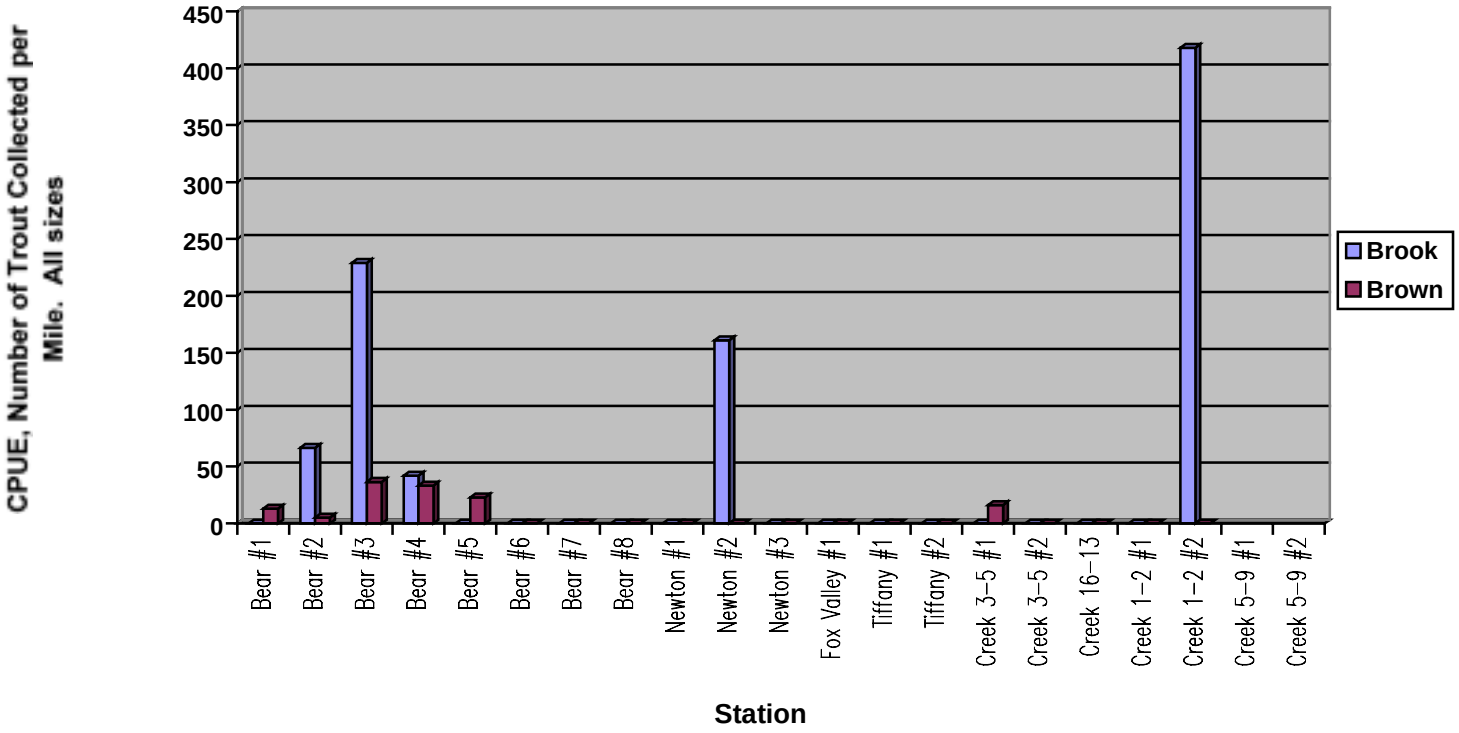
Results and discussion are provided by sub-watershed descriptions. The sub-watershed descriptions will provide detailed information on individual streams within that area. Station summaries for all sites are located in Appendix A.

Bear Creek Sub-Watershed

The Bear Creek sub-watershed includes all surface waters that drain into Bear Creek (20 sites sampled) and one small unnamed tributary stream, Creek 1-3 (2 sites sampled) that drains directly into the Chippewa River. Named tributaries streams within the Bear Creek sub-watershed are Newton Valley, Tiffany and Fox Valley Creeks and unnamed tributaries Creeks 5-9, 3-5 (Prissel Valley) and 16-13. Geologic and soil conditions in the sub-watershed vary considerably. The headwaters of Bear Creek originate in a marsh complex that is composed of wet organic and mineral soils. As it drains westerly towards the Chippewa River the stream channel cuts through silty soils of streams terraces (Bertrand/Jackson) and sandy soils of soils of stream terraces (Plainfield/Sparta) (Gebken, 1972;1976). The parent material of the sub-watershed does not allow for large quantities of coarse substrates such as gravel and cobble which are found on other streams in Western Wisconsin.

Coldwater IBI ratings on streams within the sub-watershed ranged from very poor to fair and habitat ratings were rated as fair to good on all sites. Major factors limiting habitat on all streams within the sub-watershed are the lack of coarse substrate and an excessive sand bedload. Trout abundance was low to moderate on the mainstem of Bear Creek, but many tributary streams did not contain trout. Mainstem reaches of Bear Creek had the highest salmonid abundance in the sub-watershed and had multiple year classes of brook and brown trout (Figure 2). Creek 1-3 coldwater IBI ratings were rated as very poor and excellent and habitat ratings were fair to good. Trout abundance was moderate at one site near the mouth of Creek 1-3 which had the highest trout abundance (418 brook trout per mile) of all sites in the sub-watershed. Newton Valley Creek and Creek 3-5 were the only tributary streams that contained trout, but CPUE values were 161 and 16 fish per mile respectively which is considered low and no trout reproduction was present. Two large springheads are present on Newton Valley Creek but, they have been degraded by past landuse and beaver activity. Tiffany Creek, Fox Valley Creek, Creek 31-1 and Creek 16-13 had coldwater IBI rating ranging from very poor to poor and the fish assemblage was not representative of a coldwater fish community. Habitat ratings at these sites were fair to good. Habitat conditions are again limited by the absence of coarse substrate and an excessive sand bedload.

Figure 2: Trout Abundance, Bear Creek Sub-Watershed



Previous Stocking Practices

Historic stocking practices within the Bear Creek sub-watershed have been sporadic over the past forty years. Yearly stocking occurred on a consistent basis starting in 1998 by lower Chippewa River Basin fisheries biologists (Table 1). It appears that the current stocking rate of fingerling brown trout are having marginal impacts on recruitment of larger brown trout within the mainstem of Bear Creek.

Table 1: Bear Creek Stocking Record

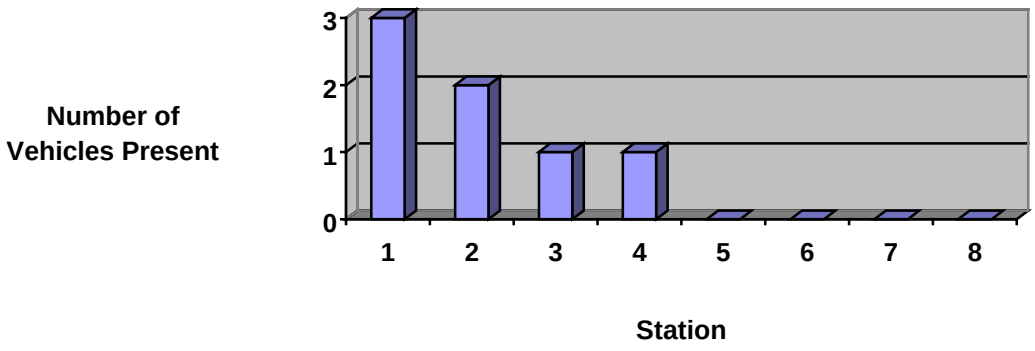
Stream	Year	Month	Species	#Stocked	Size	Stage
Bear	1998	March	Brown	1485	9.0	Holdover
Bear	1998	September	Brown	2000	5.3	Fingerling
Bear	1999	April	Brown	1800	8.9	Holdover
Bear	1999	September	Brown	2000	4.5	Fingerling
Bear	2000	March	Brown	1800	9.0	Holdover
Bear	2000	September	Brown	2000	4.7	Fingerling

Brook trout are the dominant salmonid species present in the sub-watershed and multiple year classes of brook trout were captured on the mainstem of Bear Creek even though no stocking of brook trout has occurred according to Department records, except that Newton Valley Creek has been stocked with fingerling brook trout over the past decade. It is likely that a portion of these fish stocked into Newton Valley Creek are filtering down into the mainstem of Bear Creek which could explain why larger numbers of brook trout are present in the mainstem of Bear Creek. In addition, it is also plausible that limited reproduction of brook trout could be occurring on very small spring feeder streams that drain into the mainstem of Bear Creek. These small feeders are typically small, less than 0.2 miles in length and were not sample during this survey due to access and site locations.

Opening Day Angler Counts

Angler counts were conducted on opening day of the 2000 fishing season between 7-9 am in an effort to determine angling pressure and angler interest on local coldwater resources. Angling pressure within the Bear Creek sub-watershed was limited to the mainstem of Bear Creek (Figure 3.)

Figure 3: Mainstem of Bear Creek Opening Day Vehilce Count



Angling pressure indicates that the mainstem of Bear Creek receives moderate angling pressure and the majority of the fishing pressure is downstream of station 4, where trout abundance is highest. No other signs of angling pressure were present on other streams within the sub-watershed.

Hilsenhoff HBI Ratings

Hilsenhoff (HBI) ratings were calculated for five sites in the Bear Creek sub-watershed (Table 2). HBI ratings ranged from excellent to very good which indicates organic pollution is limited.

Table 2. Hilsenhoff Biotic Index Ratings. Bear Creek Sub-Watershed.

Stream	Station	Rating
Bear Creek	2	Excellent
Bear Creek	5	Very Good
Newton Valley	1	Excellent
Tiffany Creek	1	Very Good
Tiffany Creek	2	Very Good

Thermal Monitoring

Continuous thermal monitoring was conducted at three sites within the Bear Creek sub-watershed (Table 3). Thermal monitoring was also conducted at Elk Creek in Chippewa County which is a Class I brown trout fishery. The Elk Creek site will be used as a high quality reference site in which to compare thermal data within the Bear Creek sub-watershed.

Table 3: Continuous Thermal Monitoring, Bear Creek Sub-watershed. 8/3/99-8/31/99.

Stream	Station	County	Min	Max	Mean
Bear Creek	2	Pepin	55.3	64.9	59.8
Bear Creek	5	Buffalo	52.5	66.3	58.7
Tiffany	1	Buffalo	53.2	67.7	58.8
Elk Creek	**Cty M**	**Chippewa**	**53.8**	**67.6**	**59.4**

Thermal monitoring data indicates that two of the three sites within the Bear Creek sub-watershed have lower mean and minimum temperatures when compared to Elk Creek in Chippewa County. All sites within the Bear Creek sub-watershed had lower or very similar maximum stream temperatures when compared to Elk Creek in Chippewa County. The thermal data indicates that thermal conditions within the Bear Creek sub-watershed are within acceptable ranges for trout recruitment and possibly reproduction.

Bear Creek Sub-Watershed Summary

From the information that was collected trout abundance is considered low to moderate on mainstem reaches of Bear Creek. Brook trout are the dominant salmonid within the sub-watershed. Angler use is moderate on the mainstem reaches of Bear Creek. Coldwater IBI ratings are fair to poor and HBI ratings are excellent to very good. Habitat is generally fair to good and the main limiting factor is an excessive sand bedload and lack of coarse substrate. This is likely due to past landuse practices as well as the geologic and soil parent material in the sub-watershed. Thermal monitoring data suggests that mainstem reaches of Bear Creek have the ability to support healthier coldwater fish communities and also higher overall trout abundance. NewtonValley Creek has the highest index ratings of all tributary streams in the Bear Creek sub-watershed but, trout abundance is low. Creek 1-3 has a small healthy brook trout fishery and should be protected.

Management Recommendations

1. Fish stocking practices on Bear Creek should be changed. Currently the mainstem of Bear Creek receives low numbers of fingerling brown trout and their abundance is very low. Stocking practices should be changed to promote a put, grow and take brook trout fishery because they are currently the dominant salmonid in the sub-watershed. Wild brook trout fingerlings would be preferred, but the current supply of wild fingerlings from hatcheries is very limited. At this time it is recommended that stocking quotas should be increased to 13,200 domestic brook trout spring fingerlings on an annual basis. This change is consistent with the recommended stocking guidelines on a per acre basis. In the future if wild brook trout fingerlings become more readily available from Department hatcheries, it is recommended that wild brook trout fingerlings replace the domestic strain due to better survivialship (Avery, Nieber and Vetrano, 2001). Additional brook and brown trout stocking could be allowed when surplus fish are available from hatcheries. The stocking of surplus brown trout would allow for a few fish to possibly reach larger quality size ranges (>14 inches) for local anglers due to ample forage and good growth rates. Holdover (> 8 inches) brook trout should also be stocked into the mainstem of

Bear Creek to provide anglers with harvestable fish consistent with past stocking practices. If the fingerling brook trout stocking is successful, it is recommend that holdover brook trout stocking be eliminated in the future. A stocking evaluation should occur annually until 2005 to monitor the success of these stocking efforts. The goal is to obtain fish densities at 750-1000 fish per mile by 2005 at all locations on the mainstem of Bear Creek.

2. Trout angling regulations for all coldwater streams in the Bear Creek sub-watershed should be changed to category four water. The category four-regulation change would protect existing and future brook trout fisheries, allow harvest of spring holdover brook trout and protect a few brown trout that would be stocked when available. In addition it would simplify regulations for anglers in the local area.

3. Bear Creek can be upgraded to Class II brook and brown trout water for 6.0 miles from Pepin County Highway V to State Highway 85 and be changed to Class III brook and brown trout water from Pepin County V upstream 2.0 miles. Creek 1-3 should be classified as Class II brook trout water from the mouth upstream to Pepin County Highway M.

4. Trend thermal monitoring should occur on select sites in the Bear Creek sub-watershed until 2005. This trend thermal data would provide additional data on thermal regimes during the stocking evaluation period.

5. The Department should work with local Conservation clubs, Pepin County Land Conservation office and the local NRCS office on potential habitat restoration and protection activities. Potential projects could consist of spring restorations on Newton Valley Creek and instream habitat restoration activities on the mainstem of Bear Creek. By initiating these activities it is likely that spawning and nursery habitat as well as, overhead cover could be significantly enhanced and would aid in the recovery of the coldwater fish community.

6. The Department should consider adding the mainstem of Bear Creek to the stewardship streambank protection program. In addition the Department should pursue acquisition of Creek 1-3 through the lower Chippewa River State Natural Area. It contains a native coldwater brook trout fishery.

7. The Department, Pepin County and the NRCS should promote BMP's for nutrient, riparian and near shore habitat management on all streams in the Bear Creek sub-watershed. Efforts should be targeted at buffer installations, rotational grazing, flood control as well as barnyard and nutrient management.

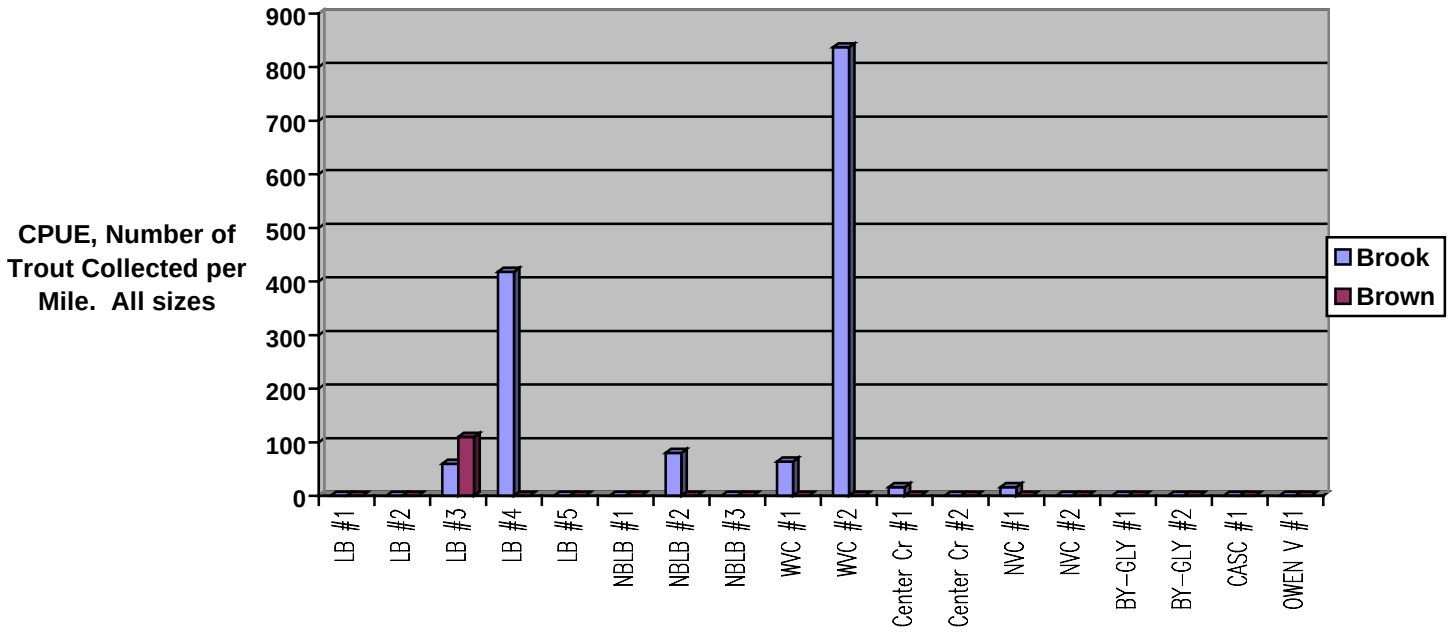
8. Beaver activity should be monitored and if deemed necessary a trapping and removal program be initiated. If beaver densities increase, it is likely thermal degradation would occur.

Little Bear Creek Sub-Watershed

Little Bear Creek sub-watershed includes the main stem of Little Bear Creek and all its tributary streams from its headwaters downstream to the Chippewa River in Buffalo County (17 sites sampled). It includes named tributaries Weisenbeck Valley Creek, North Branch of Little Bear Creek, Norweigen Valley Creek, Cascade Valley Creek, Center Creek, and unnamed tributaries Creeks 31-10 and 23-3. By-Golly Creek is also considered part of the little Bear Creek sub-watershed (2 sites sampled). It is a small coulee stream that drains into the Chippewa River bottoms near Nelson. Geologic and soil conditions in the sub-watershed consist of silty soils of rolling uplands (Dubuque/Fayette) and sandy soils of stream terraces (Plainfied/Sparta) along the valley floor. The parent material of the sub-watershed does not allow for large quantities of coarse substrates such as gravel and cobble which are found on other streams in Western Wisconsin.

Coldwater IBI rating ranged from excellent to very poor. Excellent ratings were found at one site on each of the following streams; Weisenbeck Valley Creek, Center Creek and Little Bear Creek. Habitat ratings ranged from good to fair at all sites sampled. Main factors limiting habitat conditions on streams within the Little Bear Creek sub-watershed are the lack of coarse substrate and an excessive sand bedload. Trout abundance in the sub-watershed varied by site and location (Figure 4). Trout abundance was highest at Weisenbeck Valley Creek #1 and Little Bear Creek #4 where trout abundance is considered moderate. Trout abundance was low or no trout were present at other locations within the Little Bear Creek sub-watershed.

Figure 4: Trout Abundance, Little Bear Creek Sub-Watershed.



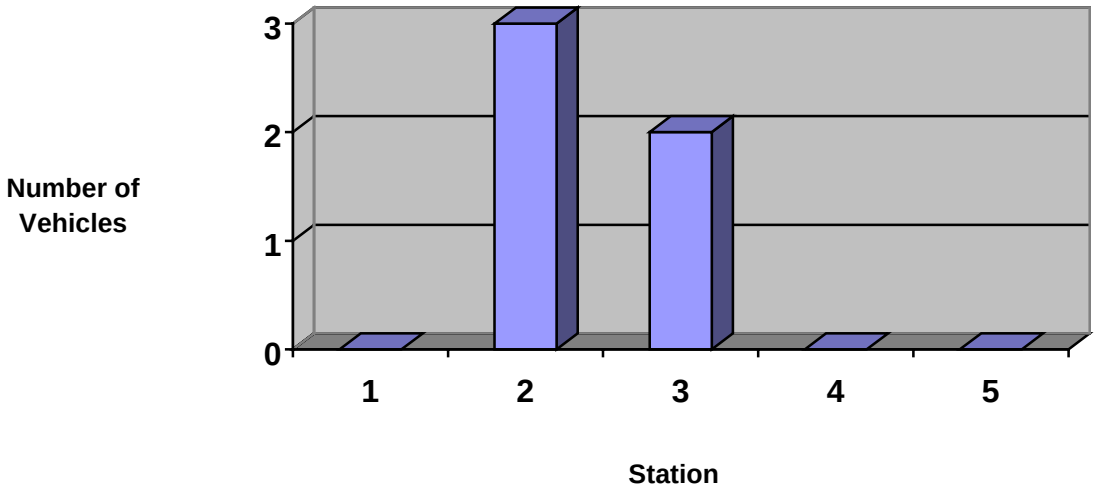
Previous stocking practices

The Department of Natural Resources has not been stocking streams in the Little Bear Creek sub-watershed. The Nelson Rod and Gun Club has stocked the mainstem of Little Bear Creek in the past with low numbers of fall fingerling brown trout but stocking records are incomplete.

Opening Day Angler Counts

Angler counts were conducted on opening day of the 2000 fishing season between 7-9 am in an effort to determine angling pressure and interest on local coldwater resources. Fishing pressure was present only on the mainstem of Little Bear Creek (Figure 5). Fishing pressure is considered moderate on the mainstem of Little Bear Creek.

Figure 5: Opening Day Vehicle Count, Mainstem of Little Bear Creek



Hilsenhoff HBI Ratings

Hilsenfoff (HBI) ratings were calculated for five sites in the Little Bear Creek sub-watershed (Table 4). HBI ratings ranged from excellent to very good which indicates organic pollution is limited. HBI scores on the North Branch of Little Bear scored higher when compared to the mainstem of Little Bear Creek. This could be attributed to the fact that the headwater reaches of North Branch of Little Bear Creek is intensively farmed for agricultural purposes and that organic pollution is likely higher in this region.

Table 4. Hilsenhoff Biotic Index Ratings. Little Bear Creek Sub-watershed.

Stream	Station	HBI Score	Rating
Little Bear Creek	1	2.057	Excellent
Little Bear Creek	2	2.173	Excellent
Little Bear Creek	4	2.050	Excellent
NB Little Bear Creek	1	4.075	Very Good
NB Little Bear Creek	2	3.840	Very Good

Thermal Monitoring

Continuous thermal monitoring was conducted at three sites within the Little Bear Creek sub-watershed (Table 5). Thermal monitoring was also conducted at Elk Creek in Chippewa County which is a Class I brown trout fishery. The Elk Creek site will be used as a high quality reference site in which to compare thermal data within the Little Bear Creek sub-watershed.

Table 5: Continuous Thermal Monitoring, Little Bear Creek Sub-Watershed. 8/3/99-8/31/99.

Stream	Station	County	Min	Max	Mean
Little Bear Creek	4	Buffalo	43.9	79.4	60.4
Little Bear Creek	1	Buffalo	55.3	67.7	61.0
NB Little Bear	3	Buffalo	50.4	67.0	57.2
Elk Creek	**Cty M**	**Chippewa**	**53.8**	**67.6**	**59.4**

Thermal monitoring data indicates North Branch of Little Bear Creek has better thermal regimes than the Elk Creek reference site. The two sites on the mainstem of Little Bear Creek had higher maximum and mean temperatures when compared to Elk Creek. It should be noted that the two sites chosen on the mainstem of Little Bear Creek where at the upper headwater site and near the mouth and thermal data was not collected in the middle portions where we found the highest trout abundance and best coldwater IBI scores on the mainstem of Little Bear Creek. From the thermal information, North Branch of Bear Creek appears to be a good candidate for trout recruitment and possibly reproduction. In addition, thermal conditions on the mainstem of Little Bear Creek can support a put-grow and take salmonid fishery where angling pressure is highest. Max/Min thermometers indicate that By-Golly Creek and Norweigen Valley Creek likely have thermal regimes, which could support coldwater fish communities (Appendix A).

Little Bear Creek Sub-Watershed Summary

From the information that was collected trout abundance is considered moderate on the headwaters of Weisenbeck Valley Creek and one site on the mainstem reaches of Little Bear Creek. Brook trout are the dominant salmonid within the sub-watershed. These brook trout were not stocked and are likely wild fish that are reproducing in the sub-watershed at low levels. Brown trout densities are low, but the potential to grow larger brown trout exists on the lower reaches of the mainstem of Little Bear Creek where thermal conditions are less optimal for brook trout and ample forage is available. Angler use is moderate on the mainstem reaches of Little Bear Creek. Coldwater IBI ratings are excellent to poor and HBI ratings are excellent to very good. Two primary factors that currently limit habitat conditions in the sub-watershed are lack of coarse substrates and an excessive sand bedload. Thermal monitoring data suggests that North Branch of Little Bear Creek has the ability to support healthier coldwater fish communities and overall trout abundance as well as trout reproduction. In addition mainstem reaches of Little Bear Creek likely has the potential to provide a put-grow and take salmonid fishery where angling pressure is moderate. Based on thermal data collected, By-Golly and Norweigen Valley Creeks may have to ability to support a coldwater fish community.

Management Recommendations

1. Stocking practices should be initiated in the Little Bear Creek sub-watershed from 2002-2005 and be evaluated on an annual basis. Wild brook trout fingerlings should be introduced into North Branch of Little Bear Creek. It is recommended that 4300 spring fingerlings be stocked into North Branch of Little Bear Creek. This is the recommended stocking rate for wild trout fingerlings for 10 acres of water. Domestic brook trout fingerlings should be stocked on the mainstem of Little Bear Creek where current brook trout levels are low to moderate and angling pressure is moderate. This stocking will help supplement variable recruitment and provide a put, grow and take brook trout fishery. It is recommended that 7,600 domestic spring fingerlings be stocked at stations 3, 4 and 5 on the mainstem of Little Bear Creek. This is the recommended stocking rate for spring domestic fingerlings for 12 acres of water. If wild brook trout fingerlings become more readily available from Department hatcheries in the future it is recommended that stocking quotas be switched to wild brook trout fingerlings due to better survivialship when compared to domestic strains (Avery, Nieber and Vetrano 2001). Brown trout fingerlings should also be stocked on the lower reaches of Little Bear Creek where thermal conditions are not optimal for brook trout and the potential to produce quality sized brown trout (> 14 inches) exists. It is recommended that 3600 fall fingerling brown trout be stocked at stations 2 and 3. An annual stocking evaluation should occur at select sites from 2002-2005 to determine the success of initiating stocking practices in the Little Bear Creek sub-watershed. The goal is to obtain fish densities at 750-1000 fish per mile by 2005 at all locations. In addition, the goal on North Branch of Little Bear is to provide a viable self-sustaining brook trout fishery by 2005.

2. Trout angling regulations for coldwater streams in the Little Bear Creek sub-watershed should be changed to category four water. The category four regulation change will protect existing and future brook trout fisheries and protect a few brown trout that would be stocked on the lower sections of Little Bear Creek. In addition, it would simplify regulations for anglers in the local area.

3. Little Bear Creek should be classified as Class II brook and brown trout water for 7.1 miles from Buffalo County Highway F to Little Bear Creek Road. North Branch of Little Bear Creek should be upgraded and reclassified as Class II brook trout water for its entire length (4.7 miles). Weisenbeck Valley Creek should be classified as Class II brook trout water for its entire length of 3.1 miles

4. Trend thermal monitoring should occur on select sites in the Little Bear Creek sub-watershed until 2005. This trend thermal data will provide additional data on thermal regimes during the stocking evaluation period.

5. The Department should work with local clubs, landowners, Buffalo County Land Conservation Office and the local NRCS office on potential habitat restoration activities within the Little Bear Creek sub-watershed. Potential projects could consist of in-stream habitat improvement activities on North Branch of Little Bear Creek, Weisenbeck Valley Creek and the mainstem of Little Bear Creek.

6. The Department should consider adding North Branch of Little Bear Creek and a portion of the mainstem of Little Bear Creek to the stewardship streambank protection program.

7. The Department, Buffalo County Land Conservation office and the local NRCS office should promote BMP's for nutrient, riparian and near shore habitat management and protection on all streams in the Little Bear Creek sub-watershed. Efforts should be targeted at buffer installations, rotational grazing, flood control as well as barnyard and nutrient management.

8. Beaver activity should be monitored and if necessary, a trapping and removal program be initiated. If beaver densities increase, it is likely thermal degradation would occur.

9. The Department should evaluate possible brook trout re-introductions into By-Golly and Norwegian Valley Creek within the Little Bear Creek sub-watershed.

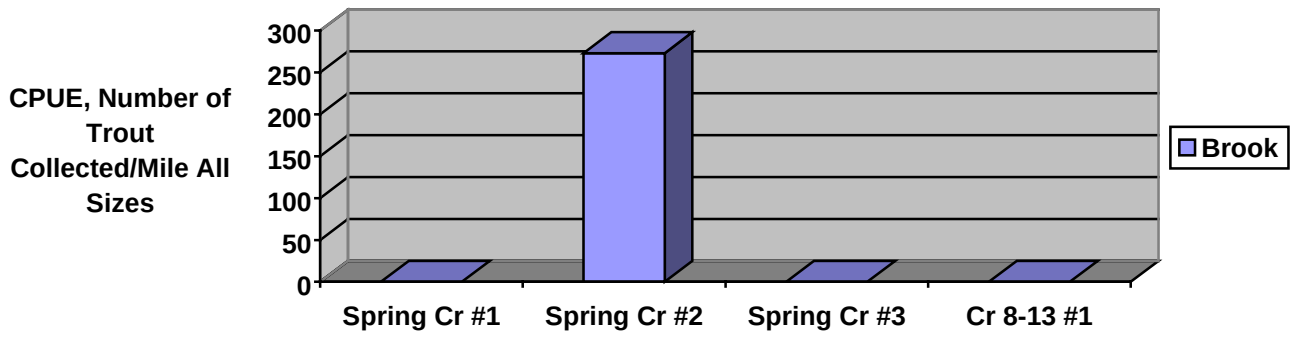
Spring Creek Sub-Watershed

The Spring Creek sub-watershed includes the mainstem of Spring Creek (3 sites sampled) and all its tributary streams from central Buffalo County downstream to the Chippewa River. It includes one unnamed tributary Creek 8-13 (1 site sampled). Geologic and soil conditions in the sub-watershed consist of silty soils of rolling uplands (Dubuque/Fayette) and sandy soils of stream terraces (Plainfied/Sparta) along the valley floor (Gebken 1976). The parent material of the sub-watershed does not allow for large quantities of coarse substrates such as gravel and cobble which are found on other streams in Western Wisconsin.

Coldwater IBI ratings ranged from excellent to very poor. Mainstem reaches of Spring Creek at station #2 received the only excellent score. Habitat ratings ranged from fair to good at all sites in the sub-watershed. The main factors limiting habitat conditions on streams within the Spring Creek sub-watershed are the lack of coarse substrates and an excessive sand bedload.

Trout abundance in the Spring Creek sub-watershed is presented in (Figure 6). Only one site on the mainstem of Spring Creek contained brook trout. No other salmonids were captured at other sites in the sub-watershed.

Figure 6: Trout Abundance in the Spring Creek Sub-Watershed



Opening Day Angler Counts

Angler counts were conducted on opening day of the 2000 fishing season between 7-9 am in an effort to determine angling pressure and interest on local coldwater resources. Fishing pressure was not present in the Spring Creek sub-watershed

Hilsenhoff HBI Ratings

Hilsenfoff (HBI) ratings were calculated at one site in the Spring Creek sub-watershed (Table 6). The HBI rating at this site was excellent which indicates organic pollution is limited.

Table 6. Hilsenhoff Biotic Index Ratings. Spring Creek Sub-Watershed.

Stream	Station	HBI Score	Rating
Spring Creek	1	2.537	Excellent

Thermal Monitoring

Continuos thermal monitoring was conducted at one site within the Spring Creek sub-watershed (Table 7). Thermal monitoring was also conducted at Elk Creek in Chippewa County which is a class I brown trout fishery. The Elk Creek site will be used as a high quality reference site in which to compare thermal data within the Spring Creek sub-watershed.

Table 7: Continuos Thermal Monitoring, Spring Creek Sub-watershed. 8/3/99-8/31/99.

Stream	Station	County	Min	Max	Mean
Spring Creek	1	Buffalo	55.3	69.7	60.9
Elk Creek	**Cty M**	**Chippewa**	**53.8**	**67.6**	**59.4**

Thermal monitoring data indicates that Spring Creek has poorer thermal regimes then the Elk Creek reference site. It should be noted that the site used to monitor Spring Creek was near its mouth and likely provided a worse case example of thermal regimes on the mainstem of Spring Creek.

Spring Creek Sub-Watershed Summary

No stocking occurs in the Spring Creek subwatershed. Currently a low density brook trout fishery exists near the headwater reaches of Spring Creek. Further sampling should be conducted to determine the status of the Spring Creek brook trout fishery. Habitat conditions on streams in the Spring Creek sub-watershed are limited by and excessive sand bedload and an absence of coarse substrates.

Management Recommendations

1. Additional survey work should be conducted at select sites within the Spring Creek sub-watershed. This survey work should attempt to identify remnant brook trout populations, location of springs and allow the Department to effectively manage Spring Creek. No stocking is recommend at this time.

2. Spring Creek should be classified as Class II book trout water from 1.1 miles upstream of Buffalo County AA and continue downstream 1.0 miles from Buffalo County AA.

3. The Department, Buffalo County Land Conservation Office and the local NRCS Office should promote BMP's for nutrient, riparian and near shore habitat management and protection on all streams in the Little Bear Creek sub-watershed. Efforts should be targeted at buffer installations, rotational grazing, flood control as well as barnyard and nutrient management.

4. Beaver activity is present and should be targeted for trapping and removal efforts.

Bear Creek Watershed Overall

From the information that was collected streams within the Bear Creek Watershed have been improving. Coldwater IBI rating of excellent were present at sites within each sub-watershed. Some streams supported moderate levels of salmonid abundance and reproduction of wild brook trout. Prior to this survey there was only 16.8 miles of classified trout water, of which only 27% was listed as Class II trout water and 73% was list as Class III trout water. This survey has documented that the Bear Creek Watershed now supports 33.9 miles of classified trout water. Of the 33.9 miles of classified trout water in the Bear Creek Watershed, 93% is considered Class II trout water and 7% Class III trout water. Habitat conditions on all streams in the watershed are limited by the absence of coarse substrates and an excessive sand bedload. This is likely due to past-land use practices as well as the geological parent material found on the eastern slope of the Chippewa River Valley. Flooding is still a problem on streams within the Bear Creek Watershed but, are not considered a main limiting factor because all streams in West Central Wisconsin within and outside the Bear Creek Watershed experience similiar flooding and still support healthy coldwater fish communities. Stream habitat restoration activities on select sites could enhance habitat conditions for the coldwater fish community. Future management efforts should consist of modification of salmonid stocking practices, buffer installations, nutrient management, rotational grazing and possible flood control efforts at select locations in the watershed. With improvements in landuse and near shore habitat protection or restoration it is likely that the overall health of the Bear Creek watershed can be significantly improved.

Literature Citations

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Lyons etal, 1996. Development and Validation of an Index of Biotic Integrity for Coldwater Streams in Wisconsin. North American Journal of Fisheries Management 16:241-256, 1996.

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Appendix A. Guidelines for interpreting coldwater Index of Biotic Integrity (IBI) scores (from Lyons et al, 1996).

Overall IBI Score	Biotic integrity score	Interpretation and Fish community attributes
100 – 90	Excellent	Comparable to the best situations with the least human disturbance: mottled or slimy sculpins are usually common; intolerant, native stenothermal coolwater species such as lampreys or redside dace may also be present; brook trout are the primary top carnivores and are present in good numbers; exotic salmonids are absent or uncommon; tolerant species may be present in low to moderate numbers.
80 – 60	Good	Evidence for some environmental degradation and reduction in biotic integrity; either brook trout or sculpins may be uncommon or absent; exotic salmonids often dominate, keeping the abundance of top carnivores high; tolerant species may be common but do not dominate.
50 – 30	Fair	The stream reach has experienced moderate environmental degradation, and biotic integrity has been significantly reduced; total species richness is often relatively high, but intolerant and native stenothermal coldwater species are uncommon or absent; native stenothermal coolwater species and exotic salmonids may be moderately common, but tolerant eurythermal species or warmwater species or both are usually more abundant
20 – 10	Poor	Major environmental degradation has occurred, and biotic integrity has been severely reduced; total species richness may be relatively high, but intolerant species, top carnivores, and salmonids are absent; a few native stenothermal coolwater species such as brassy minnows or brook sticklebacks may persist in low numbers; tolerant eurythermal species or warmwater species or both dominate.
0 or no score	Very Poor	Human disturbances and environmental degradation have decimated the natural coldwater fish assemblage of the reach; either only warmwater and tolerant species remain, or fish abundance is so low (<25 individuals captured) that the IBI cannot be calculated.

Appendix A. Guidelines for interpreting overall warmwater Index of Biotic Integrity (IBI) scores (from Lyons, 1992).

Overall IBI Score	Biotic integrity score	Fish community attributes
100 – 65	Excellent	Comparable to the best situations with minimal human disturbance; all regionally expected species for habitat and stream size, including the most intolerant forms, are present with a full array of age and size classes; balanced trophic structure.
64 - 50	Good	Species richness somewhat below expectation, especially due to the loss of the most intolerant forms; some species, especially top carnivores, are present with less than optimal abundances or size/age distributions; trophic structure shows some signs of imbalance.
49 - 30	Fair	Signs of additional deterioration include decreased species richness, loss of intolerant forms, reduction in simple lithophils, increased abundance of tolerant species, and/ or highly skewed trophic structure (e.g., increasing frequency of omnivores and decreased frequency of more specialized feeders); older age classes of top carnivores rare or absent.
29 - 20	Poor	Relatively few species; dominated by omnivores, tolerant forms, and habitat generalists; few or no top carnivores or simple lithophilous spawners; growth rates and condition factors sometimes depressed; hybrids sometimes common.
19 - 0	Very Poor	Very few species present, mostly exotics or tolerant forms or hybrid; few large or old fish; DELT fish (fish with deformities, eroded fins, lesions, or tumors) sometimes common.
No score	Very Poor	Thorough sampling finds few or no fish; impossible to calculate IBI.

Appendix A. Guidelines for interpreting Hilsenhoff Biotic Index (HBI) values (Hilsenhoff, 1987).

Biotic Index score	Water Quality	Degree of Organic Pollution
0.00 - 3.50	Excellent	No apparent organic pollution
3.51 - 4.50	Very Good	Possible slight organic pollution
4.51 - 5.50	Good	Some organic pollution
5.51 - 6.50	Fair	Fairly significant organic pollution
6.51 - 7.50	Fairly Poor	Significant organic pollution
7.51 - 8.50	Poor	Very significant organic pollution
8.51 - 10.00	Very Poor	Severe organic pollution (putrid!)

Appendix A. General guidelines for interpreting trout abundance values during July and August in Dunn, St. Croix, Pierce and Pepin County streams, Wisconsin. Developed by Marty Engel, Fisheries Biologist, WDNR-Baldwin.

Abundance Level	C.P.U.E* No. / Mile (all sizes)	Pop. Est.** No. / Mile (>= 4.0 in.)	Pounds** Per Acre (>=4.0 in.)
Low	< 250	< 500	< 35
Moderate	250-1000	500 – 1500	40 – 90
High	1000-2500	1500 – 3500	100 – 175
Very High	> 2500	> 3500	> 175

*C. P.U.E. – Catch per Unit Effort includes all trout captured including young of the year with one pass made with standard electrofishing gear.

**Population estimates and pounds per acre obtained form the estimate include age 1 trout or trout approximately 4 inches and larger.

Appendix A: Station Summary Sheet. Bear Creek Watershed 1999

Bear Creek Subwatershed	Station	Fish	Coldwater	Trout CPUE (no/mi)	Trout CPUE (no/mi)	Trout CPUE (no/mi)	Water Temp	Opening Day
Stream	Number	Habitat Rating	IBI Rating	Brook	Brown	All	Max/Min	Vehicle Count
Bear Creek	1	Fair	Poor	0	13	13	71/56	3
Bear Creek	2	Fair	Poor	66.5	5.1	71.6	80/51	2
Bear Creek	3	Fair	Fair	229	36.4	265.4	64/55	1
Bear Creek	4	Fair	Poor	41.9	33.5	75.4	66/55	1
Bear Creek	5	Fair	Very Poor	0	23	23	65/53	0
Bear Creek	6	Fair	Very Poor	0	0	0	71/58	0
Bear Creek	7	Fair	Fair	0	0	0	68/54	0
Bear Creek	8	Fair	Very Poor	0	0	0	64/52	0
Creek 1-2	1	Fair	Excellent	418.6	0	418.6	58/52	0
	2	Good	Very Poor	0	0	0	72/53	0
Fox Valley Creek	1	Fair	Very Poor	0	0	0	63/54	0
	2	Fair	Poor	0	0	0	78/51	0
Creek 3-5 (Prissel Valley)	1	Fair	Poor	0	16.1	16.1	71/52	0
	2	Fair	Poor	0	0	0	63/51	0
Newton Valley Creek	1	Fair	Very Poor	0	0	0	62/52	0
	2	Good	Good	161	0	161	*/52	0
	3	Fair	Very Poor	0	0	0	71/49	0
Creek 5-9	1	Good	Poor	0	0	0	63/58	0
	2	Fair	Poor	0	0	0	59/48	0
Tiffany Creek	1	Fair	Very Poor	0	0	0	67/52	0
	2	Fair	Poor	0	0	0	74/47	0
Creek 16-13	1	Good	Poor	0	0	0	72/48	0
Spring Creek Subwatershed	Station	Fish	Coldwater	Trout CPUE (no/mi)	Trout CPUE (no/mi)	Trout CPUE (no/mi)	Water Temp	Opening Day
Stream	Number	Habitat Rating	IBI Rating	Brook	Brown	All	Max/Min	Vehicle Count
Spring Creek	1	Fair	Very Poor	0	0	0	69/57	0
	2	Good	Excellent	273	0	273	64/52	0
	3	Fair	Fair	0	0	0	58/50	0
Creek 8-13	1	Fair	Very Poor	0	0	0	72/57	0

Appendix A: Station Summary Sheet. Bear Creek Watershed 1999

Little Bear Creek Subwatershed	Station	Fish	Coldwater	Trout CPUE (no/mi)	Trout CPUE (no/mi)	Trout CPUE (no/mi)	Water Temp	Opening Day
Stream	Number	Habitat Rating	IBI Rating	Brook	Brown	All	Max/Min	Vehicle Count
Little Bear Creek	1	Fair	Very Poor	0	0	0	68/58	0
	2	Good	Very Poor	0	0	0	65/54	3
	3	Good	Fair	60.9	109.6	170.5	83/52	2
	4	Good	Excellent	418.6	0	418.6	63/51	0
	5	Fair	Very Poor	0	0	0	76/48	0
Weisenbeck Valley	1	Fair	Good	64.4	0	64.4	65/53	0
	2	Good	Excellent	837.2	0	837.2	59/52	0
NB Little Bear	1	Fair	Fair	0	0	0	66/52	0
	2	Good	Very Poor	80	0	80	61/51	0
	3	Good	Very Poor	0	0	0	67/51	0
Owen Valley Creek	1	Fair	Very Poor	0	0	0	78/47	0
Norweigen Valley	1	Fair	Fair	16.1	0	16.1	56/48	0
	2	Fair	Poor	0	0	0	71/49	0
Center Creek	1	Good	Excellent	16.1	0	16.1	63/53	0
	2	Fair	Very Poor	0	0	0	62/53	0
Cascade Valley	1	Fair	Very Poor	0	0	0	76/58	0
Creek 23-3	1	Fair	Very Poor	0	0	0	*/52	0
By-Golly	1	Fair	Very Poor	0	0	0	63/51	0
	2	Fair	Very Poor	0	0	0	UNK	0